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Nationalisation of the Iron and Steel Industry

It has been announced by the Government that a "large measure of public ownership" is, in the not too-distant future, to be applied to the iron and steel industry. So far as the foundry industry is concerned it is as well to realise the following factors:—(1) The man in the street still believes that "founding" is part and parcel of the iron and steel trades. (2) Government departments often follow this trend, as Press releases lend colour to the idea that ironfounding is a branch of iron and steel works practice. (3) For as long as we can remember, the Government have operated foundries in the various dockyards and arsenals. (4) The nationalisation of other industries—*e.g.*, transport—will bring more foundries under State ownership. (5) The only foundries which are really part of the steel trade are, a handful of ingot mould shops, and a few steelfoundries, whilst the iron section possesses the major part of the heavy cast-iron pipe business. Moreover, this section is mixed up with coal mining, coke oven plant, heavy engineering, motor vehicle production, and the manufacture of chemicals. (6) Some of the products indicated above have to be sold on the international market at competitive prices. (7) Some of the steelworks, especially in Sheffield, are quite small concerns manufacturing special tool steel and the like. A few of the larger Sheffield firms have small steel melting departments and devote most of their activities to the production of machine knives, twist drills and tools of various sorts.

From the above it will be obvious that the boundaries of the iron and steel trades are ill defined, and it would appear that the Government would be well advised to restrict their programme of nationalisation to those sections of the industry which are deemed to warrant wholesale reconstruction of a type difficult of attainment by private industrial endeavour. Labour relationships in this industry have been excellent for the past 50 years, and the official reason for examining the question of making a State monopoly of the iron and steel industry is based on efficiency. If this be so, why not let the Government build and operate a brand new concern and operate it in competition with private enterprise. For many years the French Government operated only a section of the national railway system, thereby allowing a comparison of efficiency to be made by the general public. Moreover, it would relieve the Government of the embarrassment of entering the international market. Buyers, when they place business, like to feel that if anything goes wrong, there is a reasonable chance of redress, but rightly fear legal action against national resources. Moreover, from time immemorial, there has been a mixing of social friendship with business, which has resulted in giving to the customer what he rightly or wrongly believes to be a special service. Such conditions are difficult to replace even in the home market, let alone overseas.

Finally, there is another aspect of the question which needs consideration. Economists state that the present international conditions demand that overseas countries which have in the past been mainly engaged in agriculture must be encouraged to industrialise. Generally speaking, that means the creation or expansion of their iron and steel industries. That done, there is still a field for export from the older manufacturing countries of the products of secondary industries, where demand is too small to warrant their production locally. Into this category enter such articles as machine knives, weigh scale beams, wire drawers' plates and special steels generally. Surely this type of business—an important section of the steel trade—is best left to private enterprise on the grounds we have already set out.

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NOTES FROM THE BRANCHES

BIRMINGHAM, COVENTRY AND WEST MIDLANDS.—That the membership was still growing and the branch in a healthy financial position was evident from the reports submitted to the annual general meeting of this branch, which was held at the Birmingham Chamber of Commerce, on Thursday, April 11, Mr. A. J. Shore presiding initially.

Mr. B. Gale, in presenting the secretary's report, asked the indulgence of members as, owing to the regrettable illness of Mr. A. A. Timmins, hon. secretary and treasurer, the complete records were not available. During the past two months the duties of secretary had been carried through by the branch president, and their thanks were due to him for the great amount of work he had accomplished in shouldering two executive offices of the branch simultaneously.

The year under review could justly be claimed successful. The return to evening meetings had resulted in increased attendances. After detailing the series of lectures given to the branch during the session, the report pointed out that papers on widely divergent subjects of foundry practice had attracted an average attendance of 70 members.

The branch membership showed a further increase. Since the last annual general meeting 49 new members had been elected, making the present membership of the branch 475. Record figures were shown by the accounts. Subscriptions amounted to £675 against £621, or an increase of £54 over 1944. As those figures were up to December 31 last, they did not take into account the new subscription rates. Expenditure for the year was £126, against an income of £138.

In congratulating Mr. Gale upon his report, the president informed members that, although he was still in hospital, Mr. Timmins was making a rapid recovery. The report and accounts were adopted, and Mr. G. R. Shotton gave a comprehensive report of the activities of the Technical Council on which he represents the branch. In this he made it clear that the Council would welcome suggestions from members. The inauguration of the Technical Students' Fund had proved very successful, and a number of young foundrymen had been co-opted on the various committees. He particularly appealed to members of the branch to put forward the names of young men whom they deemed sufficiently interested to take part in the work of the various committees of the council.

In asking members to elect Mr. E. C. Dickinson, of Coventry, as branch president for the ensuing year, Mr. Shore said he had been a member of the branch council for a number of years. He was foundry manager for Morris Motors, Limited, a master of metallurgy, and a most enthusiastic foundryman. The proposition was seconded by Mr. A. Tipper, and carried unanimously.

Mr. Dickinson then took the chair, and briefly thanked the members for the honour conferred upon him. Mr. A. G. Harrison was appointed senior vice-president, and Mr. J. Hird junior vice-president. The vacancies on the branch council were filled by the re-election of Mr. H. G. Hall and Mr. B. Gale, and the election of Mr. J. L. Francis and Mr. C. Hawkins, the latter for one year only. Mr. J. J. Sheehan, Mr. T. H. Gameson, Mr. G. R. Shotton, Mr. A. J. Shore and Mr. B. Gale were appointed delegates to the General Council, while Mr. Shotton was again elected to represent the branch on the Technical Council. Mr. A. A. Timmins was unanimously re-elected hon. secretary and hon. treasurer, while Mr. B. Gale was appointed acting secretary until Mr. Timmins' health permits him to resume office.

A hearty vote of thanks to the retiring president, officers, and members of the branch council concluded the business of the meeting, following which Mr. J. B. Longmuir, of Newton Chambers, Thorncliffe, near Sheffield, gave a paper on "Apprentice Training in the Foundry Industry."

SOUTH AFRICA.—The February meeting, held under the presidency of Mr. H. Holdsworth, was devoted to the consideration of moulding sand, especially in jobbing foundries. The president thought the use of synthetic sands quite unnecessary, a view strongly opposed by Mr. Mackay. He pointed out that since his foundry changed over to the use of bentonite bonded sand, the output of the fettling gang had increased from 250 to 1,000 castings per day. Col. Grose drew attention to the advantages to be gained by controlling the number of jolts to be given for each type of mould when using a jar-ramming machine. Objection was raised to this on the grounds that the moulding sands were variable. It was revealed that the Iscor foundries were also using synthetic sand. Obviously, there is at present much disagreement on the subject, and the discussion should be useful in focusing attention on this interesting subject.

SOUTH AFRICA—Cape section.—At the annual general meeting, Mr. L. R. Batchelor was elected president for 1946. Mr. S. A. Wilson is the new vice-president, and Mr. Harris is junior vice-president. The following members were elected to the 1946 council: Mr. G. Goad, Mr. L. Ashall, Mr. S. Wade, Mr. T. R. Pieser, and Mr. E. L. Sylvester.

The section had, at the beginning of 1945, a total membership of 31 members, comprising 6 members, 21 associate members and 4 subscribing firms, according to the secretary's general report which was submitted on January 22, 1946. The section commenced 1946 with a total membership of 36, the increase being made up of two new associate members, one associate and two subscribing firms.

The secretary regretted to report the death of Mr. H. C. Gearing, the representative member for Gearings, Limited.

During 1945, the section held eleven general meetings. The Cape section's council for 1945 consisted of 13 members, three of whom have since left the country. Mr. C. Syborn is now in England, and Mr. K. J. Zwanziger (formerly secretary and honorary treasurer), and Mr. J. C. Danvers are in the Far East. Another member of the 1945 council, Mr. R. H. Braid, is now residing in Port Elizabeth.

CLOSER CO-OPERATION BETWEEN THE FOUNDRY AND PATTERN SHOP*

Part One

By W. C. MEREDITH

The Author's chief complaint is against people with little knowledge of foundry methods who make patterns down to a price, and do not consider the trouble this entails in moulding operations. Moreover, pattern-makers have such varied ideas of pattern construction that it is almost impossible for a foundryman to give an estimate of moulding time until he has seen the pattern. The Author has recently made a cast-steel ribbed beam, 14 ft. long, 10 tons in weight. The pattern-maker had provided no taper, so that when the pattern was drawn from the sand it pulled out large pieces of the rammed sand and even the lifters reinforcing the mould. The pattern had to be taken to pieces and extra loose pieces made to allow the mould surface to be repaired. All these extra operations increased the cost of moulding.

With the present-day shortage of skilled hand-moulders it is more than ever necessary for pattern-makers to construct patterns so that they can be

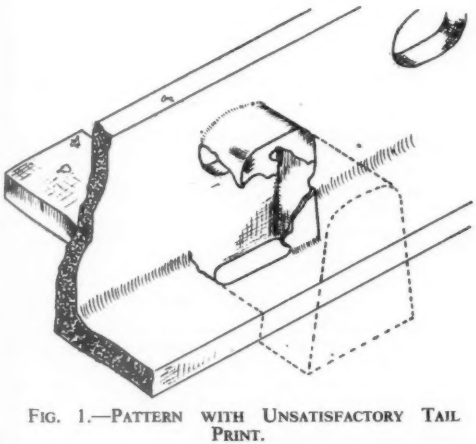

FIG. 1.—PATTERN WITH UNSATISFACTORY TAIL PRINT.

mounted on moulding-machine plates. Patterns should be made with a flat joint; whenever possible the two parts could be screwed together for hand-moulding if the quantities required do not justify machine moulding. It is a national waste for a foundry to have to make the extra patterns for moulding-machine work when the master pattern-maker could make the original patterns suitable for either hand- or machine-moulding.

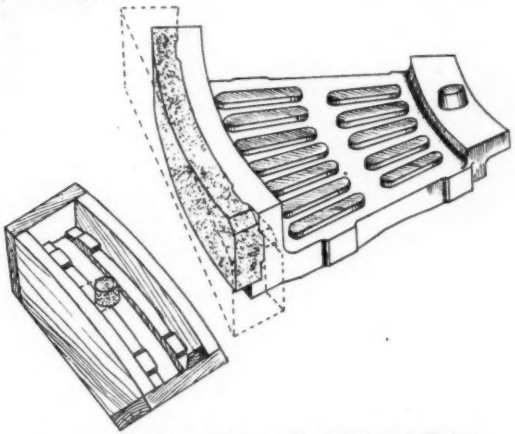

FIG. 2.—AN EXAMPLE OF A GOOD PATTERN PLATE SPOILT BY THE OMISSION OF RAPPING PLATES.

Figs. 1 to 4 show outside patterns which demonstrate that some pattern-makers do not realise how their patterns are used. Fig. 1 shows a casting with oval holes. A tail print of an unsatisfactory type was used, permitting the core to drop in the mould after it had been closed, causing a flash in the hole and an unwanted hole in the horizontal portion of the casting. Probably the pattern-maker expected the moulder to nail the cores in position, but this is an unsatisfactory method for special steel castings. The dotted outline shows the core print extended to the mould joint; the top part holds the core in position when the mould is closed.

Typical Faults

The example shown in Fig. 2 was an excellent piece of pattern-making except that no rapping plates were provided and the core prints were incorrect. The pattern-maker would have been the first to censure the moulder for sticking spikes into the pattern to with-

*Paper contributed to a discussion on "Closer Co-operation between the Foundry and Pattern Shop," before the Sheffield branch of the Institute of British Foundrymen.

Foundry and Pattern Shop

draw it from the mould. The periphery of the segment plate casting must be accurate, but this type of core print would not locate the core properly, and, as the core cannot be turned out on a flat plate, it must be placed on a bed of green sand before drying. The dotted lines show the alteration which had to be made to the core print and core box, namely, a print was added at each end for location, and the core was made with a flat back.

Forty-eight castings were required in a hurry from the pattern shown in Fig. 3, only suitable for hand-moulding because the right-hand end of the pattern had to be unscrewed after ramming, and the loose end pieces drawn away in the direction of the arrow shown in the bottom right-hand corner of the sketch. This design was ideal for flat-back machine moulding, and so the tapered end of the pattern was blocked up and this shape produced by a core as shown by the dotted outline. Incidentally these castings were all moulded in one day on the machines, and a snap delivery given. If the customer's pattern had been used for hand-moulding, this job would have occupied a moulder for a fortnight.

The bracket illustrated in Fig. 4 is a customer's pattern with numerous faults. The pattern was split through the centre line, but the core producing the vertical face was to be made in one piece. The closing clearance that had to be allowed in the top part of the mould caused the vertical walls of flash shown around the core print. This flash, unavoidable with such pattern equipment, doubled the fettling cost. A stopping-off piece was introduced into the core box, so as to produce the core in halves, so that one half

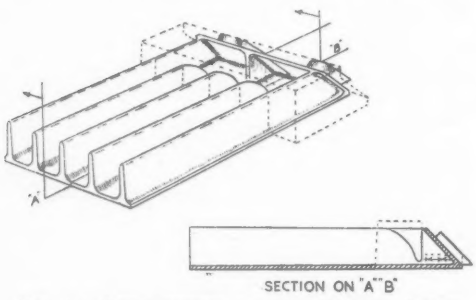

FIG. 3.—CONSTRUCTION OF THIS PATTERN LIMITS ITS USE TO HAND MOULDING.

was fastened in the bottom part of the mould and one half in the top. This pattern should have been made the other way upwards, with a flat top part and cores to produce the lower faces so that it could be machine-moulded to produce accurate castings free from flash.

The foregoing examples are patterns received from customers, and emphasise the need for close co-operation between a foundry with its own pattern shop. The Author's experience is that the man at the bench appreciates explanations of moulding problems, and he is convinced that it is advantageous for pattern-makers to work in the foundry for a period to see the moulding difficulties at first hand.

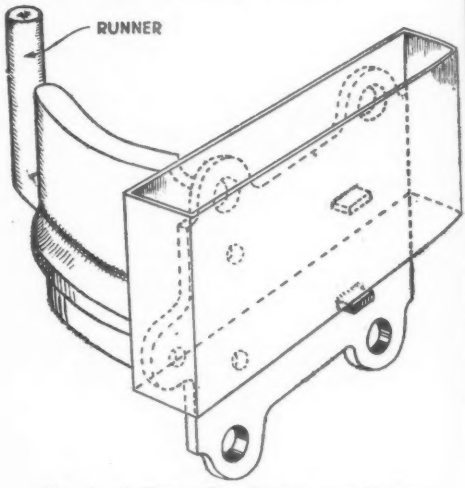

FIG. 4.—A TRULY BAD EXAMPLE OF PATTERN-MAKING.

In conclusion, the Author thanks Mr. E. C. Gardner for the excellent illustrations, and the directors of Hadfields, Limited, for permission to put forward the foundry point of view on the question of pattern construction.

(This Discussion is to be continued.)

VOCATIONAL TRAINING

Generally speaking, vocational training is available to those who have served a minimum of 12 months in H.M. Forces, in the Merchant Navy, or on other work of National importance, but have either been unable to start in a trade or have had their training interrupted. Naturally the need for training must be shown, and evidence of general capacity given. The scheme has been so devised that training is given in those trades which show a probability of future demands. In ironfounding it has been agreed that the training required by adult new entrants shall be provided by the industry itself at the standard rate of pay. Demobilised servicemen should apply to the local offices of the Ministry of Labour and National Service.

TECHNICAL CONTROL IN A MAGNESIUM FOUNDRY*

Melting technique and sand control are the essentials for scrap minimisation

By G. B. PARTRIDGE

In a modern foundry, and especially a magnesium foundry, the laboratory, which should be the hub of all technical control, plays a wide and diverse part, embracing analysis of incoming materials, current melts and scrap, sand analysis, mechanical testing, metallographic work and X-ray inspection, the results of these factors being placed in the metallurgist's hands, who, with his trained knowledge should be able to apply the various controls to the foundry in a clear and concise manner. In the particular laboratory upon which this Paper is based the staff are constantly reminded by means of notices that—"The primary consideration of this establishment is service to the foundries."

Continuing this line of thought of the place of the laboratory in the foundry, additional duties definitely include what might be termed "production research."

It is disadvantageous to the industry generally if all research is left to the purist bodies in such matters, because these people lack actual production conditions which all theoretical processes ultimately have to reach, and if no work of this kind is done much valuable information may be lost.

Magnesium Alloys

The magnesium alloys which were used in this country during the late war are the quaternary type, and contain aluminium, zinc, and manganese. Two main alloys are in general use, the most popular being Elektron A.8, supplied in three forms, as cast, annealed, and solution heat-treated, the relevant A.I.D. specifications being D.T.D. 59A and D.T.D. 289; the second is Elektron A.Z. 91, and is supplied as cast, annealed, solution heat-treated, and solution and precipitation heat-treated, the relevant A.I.D. specifications being D.T.D. 136A, 281 and 285. The first of these alloys contains approximately 8.0 per cent. aluminium, 0.5 per cent. zinc, 0.2 per cent. manganese; the second 9.50 per cent. aluminium, 0.50 per cent. zinc, and 0.20 per cent. manganese; it will be realised from observing these figures that the most potent variable is the aluminium content, which along with the small amount of zinc is alloyed to give proof, ultimate stress and elongation obtained with these alloys. The manganese is added to increase the resistance to corrosion. An alloy named A.Z. 31, which contains an aluminium content of about 3 per cent., is sometimes used on account of its high elongation, but there is little general call for it. Another alloy named AZG was very popular prior to the war for crankcases, etc., of internal combustion engines, but the zinc content is about 3, and investigators have said that due to this fact it is much more prone to micro-porosity. To-day its place is mainly taken by the A.8 alloy.

All incoming material is sampled and analysed fully before release to the foundries, and also any reclaimed scrap which has been ingoted. Periodically, samples are taken from current melts during the day and subsequently analysed. Mechanical values are ascertained by taking three test-bars from each melt. By this means A.I.D. procedure is covered, and it also gives the work's metallurgist a fair degree of chemical control of composition and a very good control of mechanical values.

Melting Technique

Melting takes place in gas- or oil-fired furnaces placed on the foundry floor, but it is the practice of some firms to sink their furnaces into the floor, which they claim gives them greater ease of operation.

Mild steel pots of 80 to 500 lb. capacity are used, and as magnesium does not pick up iron in the same way as aluminium the pots are not coated. The necessary amount of virgin metal is charged in, followed by scrap in the form of returned risers, cleaned runner, and reclaimed ingoted scrap, the whole being sprinkled with powdered flux. This is of low melting point, and consists mainly of a mixture of alkali chlorides. As melting proceeds more scrap is fed into the pot, and any burning of the metal prevented by the further addition of the same flux. When the pot is all but about 4 in. full, no more metal is charged, and a layer of fluid flux is sprinkled on the surface of the melt. The whole is then covered with a layer of high melting point flux and heating continued to about 730 deg. C. At this stage the melt is fluxed or washed; the term refined is sometimes used to describe this, but as the operation does not affect the grain size this term is possibly misleading. An iron stick or tube bent to a right angle at one end is inserted in the pot and stirring commenced, in a rotary manner, which induces the flux to sink finally through the melt and lie on the bottom of the pot, taking all impurities and accumulated oxides down with it. When the operation has been satisfactorily accomplished the metal surface is silvery white, and as the stirring rod is removed the surface of the metal is covered with a layer of high melting point flux, which effectively prevents further oxidation. All this time the furnace continues blowing and heating to about 900 deg. C., when the fuel is turned off and the melt, after gaining temperature for a little while, begins to fall. It is allowed to cool to about 780 deg. C., when any necessary test-bars are slowly poured in the usual D.T.D. type sand mould. The metal is then ready for the

*Paper read before the Birmingham, Coventry and West Midlands branch of the Institute of British Foundrymen, Mr. A. J. Shore presiding.

Control in a Magnesium Foundry

foundry, and should be cast at once or with as little delay as possible, casting temperatures varying usually from 750 to 800 deg. C. Should the melt be held at about 700 deg. C. for any length of time and not re-superheated before casting, extensive grain coarsening may result.

Sand Preparation

Sand preparation is a most important factor in making magnesium castings, and a wise policy includes the active co-operation of the laboratory at all stages. It is essential that the metallurgist should view sand control with a very broad mind, and not regard a string of analyses recorded in a book as so many figures passing a certain specification. The correct policy is to broadcast all information to the foundry staff as early as possible to keep their interest and ensure their close support with its consequent advantages. Either natural sand or synthetic sand can be used to make magnesium castings, and both are used successfully on a large scale. Natural sand has the advantage of being cheap, giving a very good finish to the casting, and is usually an easier material for the moulder to use. Its disadvantages include low permeability, high moisture content, and as its general texture lends itself to ease of ramming, should this be slightly overdone, most probably it will result in a pile of scrap work. Synthetic sands, on the other hand, offer complete control, as they are built up from a selected base with as much bond added as is required.

The synthetic sands for which the Author has been responsible were bonded with 3 per cent. bentonite and were later altered to 4 per cent. Fulbond, plus ½ per cent. bentonite due to war conditions. Moisture contents are usually 3.5 per cent., against the natural sands 5.5 per cent., and this fact should be brought home to a foundryman because when water changes into steam it expands to 1,600 times its original volume. It is not usually possible to produce a casting with such a fine finish as when natural sand is used, while patching up operations by the moulder are not effected so easily.

Higher Cost

The original cost of synthetic sand is higher than natural sand, but in a properly worked sand system the sand is merely renewed by nominal additions from time to time. Owing to the ease with which Elektron alloys chemically react with moisture and air, the moulding and core sands contain what are known as inhibitors. The most popular are elementary sulphur and powdered boric acid, but the volatile double fluorides and ethylene glycol are also used by some foundries. The correct reason why the chemicals do prevent the attack is not known positively, but it seems likely that the sulphur, in being converted to SO_2, uses up all the available oxygen, thus leaving the molten metal in a somewhat inert atmosphere—not completely inert, however, because magnesium will react with nitrogen to form brown nitrides. The boric acid changes its water content during heating and cooling and is thus able to "grip" any available water instead of the metal doing so, also it coats the sand with a glassy film which prevents actual silica reactions and protects the clay with its combined water, all of which are liable to react with the magnesium.

Supervision of sand mixes, regular and frequent use of a moisture tester and full chemical and physical tests on different batches of sand each day form the basis of the laboratory sand control. In addition, each incoming load of sand is microscopically examined and graded for grain size, and tested for clay content and moisture content. The services of the department are also used in developing mixes for special jobs, testing cores for excess gas, and, if necessary, following a job through from the mill to the actual pouring of the casting. An important point is that all mixtures from the mill are allowed to go into the foundry slightly higher in moisture content than the academic value, this prevents the operative subsequently over-wetting-up their sands and incidentally is an example of how close the laboratory must work with the foundry to be of value.

Modern Foundry Methods

During the latter years of the war attempts were made to overcome the choking sulphurous smell usually associated with magnesium foundries by separating the casting section from the moulding section. Briefly, the moulds are rammed up in the general shop, and when dried, cored-up and closed are transferred to a track which takes them along to the casting shop through an aperture in the wall where they are eventually cast and knocked out after passing through a cooling tunnel. The track is controlled by the head furnaceman who also directs the sequence of moulds to be cast. Modifications of the above are also in use and the system has found general agreement—the main difficulty is the clearing of the atmosphere in the casting and knocking-out shops. There is a sand return system operating in conjunction with the above which supplies adequate amounts of backing sand to the various moulding sections.

Moulding

Moulding operations are carried out using machines such as Adaptable, Macnab squeeze, Osborne jolt rammers and rollovers, Nichols jolt and squeeze, and Sandslingers, the various jobs being graded and distributed to the sections where they can be most economically made. Jobs which are unsuited to track work by reason of intricacy are floor-moulded in another section of the foundry.

After a casting has been moulded and cast as outlined above it is knocked out on a vibratory screen and sent into the fettling shop where it is sand-blasted, the runners and risers sawn off, and generally made a presentable job. From here it will either pass to the stores for final inspection and despatch, or go to heat-treatment, should this operation be called for.

Heat-Treatment

There are three types of heat-treatment applied to magnesium castings. The first is the so-called annealing treatment which is usually carried out in a gas-fired

stove and consists of a soak of 4 to 8 hours at about 250 deg. C. It was apparently instituted at first to relieve casting stresses, but it has a beneficial effect otherwise in raising the proof stress frequently as much as 1 ton per sq. in. and also the ultimate stress; however, the elongation suffers a slight drop. The above is brought about by precipitation at the grain boundaries of the aluminium-rich β constituent.

The second type has been utilised very much during the war, all landing wheel castings were so treated. It is usually carried out in electrically heated pit furnaces with forced air circulation and pyrometrically controlled. Treatment is in two stages, the first consisting of raising to about 390 deg. C. and maintaining for 4 hours; the second, raising to a temperature not exceeding 420 deg. C. for a period of about 20 hours; in fact, the system adopted has been to work these furnaces in 24-hour cycles. The ultimate tensile strength and elongation is considerably increased by this treatment and is due to taking the β constituent into solution.

The third type has not been used much in this country; it consists of a low-temperature treatment of about 10 hours at 200 deg. C., following upon the solution treatment which causes precipitation from the saturated solid solution similar to that obtained with the simple annealing. The main disadvantage with the material in this condition is that the elongation is very low.

Sections are cut from castings and microscopically examined regularly to check up on heat-treatment. Castings having an original large grain size and thus containing more massive β particles are apt not to solution-heat-treat properly. Distortion or sagging of overhanging heavy sections is very liable to occur during heat-treatment and castings so designed have to be very carefully packed to prevent this defect.

Inspection

After heat-treatment the castings are dipped in a boiling chromate salts solution for 30 minutes, which gives them a black matte finish and forms a useful base for subsequent paint protection. The castings are despatched in this black dipped state. Should the castings be in the A.I.D. Class 1 or 2 category they would be forwarded to the laboratory for X-ray examination, which involves using a set-up which has been developed at the A.I.D. test house, Harefield, and is called an X-ray technique. It means that the direction of the X-ray beam is carefully adjusted to take or fire at certain areas of the casting, depending upon their relative position, and also states if filters are to be used, etc. The laboratory which does this work has to be approved by the A.I.D. and all films are scrutinised by two separate approved radiologists. The well-known Halifax bridge took 33 shots to give it complete cover, after a time, however, a reduction was allowed which involved taking the stressed areas only. This is a lesson which has yet to be learned, painfully or otherwise, by all interested in the magnesium foundry industry; to be of any real use X-ray examinations for magnesium castings inspection must be detailed and have maximum academic qualities—in other words, due to its low adsorption co-efficient it is difficult to pick up slight density differences especially taking into account the diverse shapes encountered in many castings to-day.

The fundamentals to work on are: (1) Use of the finest possible X-ray film; (2) use of a tube with a fine focal spot; (3) use of 4 to 5 ft. minimum tube film distance; (4) use of the lowest KV sufficient to penetrate the section; and (5) obtaining good film object contact. There are other tricks of the trade which also have to be applied, but a description of these would involve a Paper on works radiography. Defects which are usually detected are internal blows, oxide pockets, flux, microporosity, and foreign inclusions. It is the presence of microporosity which is most difficult to determine and the foregoing remarks about the radiography of magnesium are concerned with this defect.

Defects

Much has been written about microporosity, its cause and effect, and it is difficult to explain it in a few words. However, it consists of voids located between the grain boundaries, generally upon a microscopic scale, and reduces the ultimate tensile strength considerably, especially of the heat-treated material. It is overcome in the foundry by good feeding conditions, correct balance of feed and chill, good venting, and metal free from gas. This last point is especially noteworthy, as there is a school of thought at the present time which appears to disregard the presence of gas in magnesium—this attitude is quite incorrect.

Oxidation or burning of the metal during its period in the mould before knocking out is another annoying defect, and is overcome by maintaining correct moisture conditions and having a sufficient supply of inhibitor in the sand. As these conditions are easily displaced in a foundry they require constant vigilance.

Entrapped metal oxide skin or dross, commonly known as scum, occurs where the metal is improperly prepared, or the gating system has not been efficient. The above are allied with many others of the more usual foundry type, such as blows, occasional scabs, draws, etc., but burning during heat-treatment is another defect to which magnesium is susceptible, and takes the form of tiny volcanoes, the point of fusion being the low melting point eutectic.

Some modern developments in the industry include (1) an attempt to produce a magnesium alloy with a much higher proof stress. This has been done, but the metallurgical difficulties encountered prevent its practical application for the time being; (2) the elimination of the superheating process by a treatment of the melt with chemicals—this being cheaper, much quicker, and results in an equal refinement of the grain size; and (3) the total elimination of oil or dextrine binders from coremaking. In at least one foundry it has been replaced by clay-bonded sand throughout. This necessitates care of handling, but it is possible as shown by this foundry.

General Pointers

With magnesium casting alloys, wall thicknesses of less than $\frac{1}{8}$ in. are not permissible, and only $\frac{1}{4}$ in. thickness is permitted for small sections. Large horizontal flat sections are avoided where possible, as

NEW CATALOGUES

Platinum: Rhodium-Platinum Thermocouples.—Johnson Matthey & Company, Limited, of 73-83, Hatton Garden, London, E.C.1, have sent us a particularly interesting and useful booklet covering this subject. The reviewer (and he is sure recipients of this brochure will share his views) is of opinion that much of the information given is either new or only found with much difficulty. He had no notion that a purity of the order of 99.999 per cent. platinum was normally achieved. For the platinum—13 per cent. rhodium, only ingots which have been thoroughly tested are passed forward for wire drawing. Finally, samples of wire are sent to the N.P.L. for complete calibration over the range 100 to 1,600 deg. C. Life tests have shown no deterioration in calibration or tensile strength after 100 hours at 1,500 deg. C., whilst at lower temperatures superior performances are shown. Naturally, proper sheathing is presumed, for in reducing atmospheres using bare wires above 900 deg. C. there is a danger of deterioration.

A useful table (No. III) is given for cold junction correction. whilst centrally in the book are set out tables for the standard calibration for these thermocouples. Some notes are given on the Schofield-Grace methods for the determination of the temperatures of liquid steel. Where greater E.M.F. is required, than is given by the Pt—13 per cent. Rd—Pt for readings up to 500 deg. C. a palladium-gold: iridium-platinum carrying the apt trade name of "Pallador," has been found to be particularly useful. Metallurgists will have a better appreciation of the thermocouples they use if they do as is recommended write to the issuing company for a copy of this brochure.

Foundry Mechanisation.—A new publication, "Foundry Mechanisation by Specialists," issued by Augusts, Limited, of Halifax, has the gayest cover ever seen by the reviewer in connection with foundry equipment trade literature. It is the vision of the future—foundry speed, light and cleanliness, which is so pleasing. The opening pages are particularly well written and their cogent presentation of the subject instills confidence that the management of the issuing house is master of its job. The brochure contains no dull information as to capacity ranges, shipping weights, and so forth, but, instead, vividly tells of the efforts made by the company since before the 1914-18 war to improve the manufacture of castings by the use of mechanical devices. It should be read by everybody in the industry because it gives the lie direct to those who—parrot-like—emphasise on all possible occasions the obsolescence of the foundry industry. This firm alone must have mechanised at least fifty foundries, and, judging by the space devoted to its detailed description, the greatest satisfaction is expressed at the creation of the famous Rolls Royce foundry at Hillington, Glasgow. The brochure runs to 32 pages, and throughout maintains an excellent standard of layout and illustration.

(*Continued at foot of next column.*)

TECHNICAL CONTROL IN A MAGNESIUM FOUNDRY

(*Continued from previous page.*)

the metal loses its heat very rapidly, resulting in excessive scrap due to cold shuts. A peculiar cause of misruns is casting at too high a temperature; it will be seen that due to the ease with which magnesium alloys burn an increase of temperature will favour the formation of oxide film, which will prevent the metal streams from welding together and so result in a misrun.

The effect of hydrogen upon the properties of magnesium is drastic, resulting in widespread microporosity and a serious decrease in the mechanical values. Finally, there is the corrosion problem. Salt water attacks rapidly, and brine is the accepted medium for testing the resistance of most metals to corrosion, yet magnesium is but one of many alloys which are attacked. After proper protection with paint, however, the trouble is obviated, providing no small area is left unprotected which would be the jumping off ground for the insidious work to commence. It should be more widely known that ordinary magnesium alloys are not corroded so much as iron and steel in normal atmospheres when no surface protection is given, and to illustrate this point the Author passed round a machined test-bar which had been alternatively lying on the soil of his garden or in his fish pond for about two years.

INCOME TAX

The Board of Inland Revenue have sent us three pamphlets dealing with this subject. They are No. 410, "Notes on Allowances for Industrial Buildings"; No. 430, "Notes on Allowances for Machinery or Plant," and No. 490, "Patents and Income Tax." As no indications of price are given, it is presumed that interested parties may have them free of charge on application to the Board at Somerset House, London, W.C.2. The notes are exceptionally clearly set out and a number of practical examples are given. Foundry owners should certainly procure copies for their own use as we feel sure they will be most helpful in securing the various allowances.

PICKERINGS, LIMITED, are opening their own offices in Glasgow, at 131, West Regent Street, for the sale and service of electric passenger and goods lifts, and hoists.

NEW CATALOGUES

Precision Grinding in the Railway Shop.—The reviewer congratulates the publicity department staff of the Churchill Machine Tool Company, Limited, of Broadheath, nr. Manchester, on the excellent presentation of a catalogue bearing the above heading. The layout of every page has been so studied as to emphasise either by caption, letterpress, or illustration one definite aspect of the subject treated. Readers engaged in the locomotive engineering industry will find it of outstanding interest.

NICKEL DIPPING*

By G. H. McINTYRE
DIRECTOR OF RESEARCH, FERRO-ENAMEL CORPORATION

[ABRIDGED]

A thorough discussion of nickel flashing steel for porcelain enamelling was presented at the Second Annual Forum of the Porcelain Enamel Institute at Ohio State University in October of 1937 by James Pettyjohn,[1] then of the Mullins Manufacturing Corporation. The advantages and disadvantages of nickel treatment were covered in detail. Mr. Pettyjohn claimed for the advantages:—Reduced copperheading, better bond of the ground coat to the steel base, more uniform steel surface texture, prevention of fishscaling, more uniform ground coat colour and prevention of rusting of ware in storage. For the disadvantages, it was said that good repickled ware was difficult to obtain, the cost was appreciable ($0.022 per 100 sq. ft. of ware treated with single nickel salts at 13½ cents per lb. and aqua ammonia at six cents per lb.), and the very close control of a nickel dip tank which is required. While not listed as a disadvantage, the discussion period that followed brought out clearly the importance of sludge removal and general rinsing problems, associated with nickel treatment.

Review of the Literature

Numerous articles on nickel dip, its control and application to porcelain enamelling have appeared in the literature over the past 15 years. Since many of these give accurate and specific instructions for the control of acidity, and nickel content,[2] it is not within the scope of this Paper to dwell on the methods used, but rather to stress the importance of such control, the permissible ranges of the pertinent variables in operation and the general effects of nickel treatment in relation to blue ground coat and particularly for application of white direct to steel.

In an excellent article appearing in the November "Journal" of the American Ceramic Society, Wainer and Baldwin[3] have discussed nickel deposition entirely from the viewpoint of the nature of the nickel deposit and its relation to porcelain enamel adherence. Several important and illuminating statements are made and conclusions drawn. These authors say that "small amounts of corrosive agents, probably sulphates, will oxidise the nickel. Adequate rinsing between nickel flash and neutraliser is thus indicated as a requirement." If adherence alone be considered, this is undoubtedly true. Wainer and Baldwin further state "the zircon enamels developed adherence at a nickel content of 0.025 to about 0.10 gms. per sq. ft., the optimum approximately 0.05 gms. per sq. ft. To ensure adherence for the zircon enamels, close control of the nickel flash is required. *With any enamel, adherence can be destroyed by the deposition of too much nickel.*"†

Hansen and Irwin[2] stated in 1935 that solutions too high in nickel salt content caused difficulties in dipping and draining enamels, causing streaked enamel as well as occasional blistering. They also said that ware heavily "nickelled," if scratched before coating with porcelain enamel, oftentimes shows a row of blisters over the scratch after firing. These authors concluded that "nickel dips, properly used, promote adherence of porcelain enamels to sheet iron or steel, minimise or at least decrease fishscaling and control or decrease copperheading."

Variables to be Controlled

For good porcelain enamelling practice, it should be the aim of every shop operator constantly to control all operations throughout the shop. For successful nickel application, control is a *must*. The Author believes that all difficulties encountered in utilising nickel flash and any doubt as to the efficacies gained are because of a lack of appreciation of the importance of uniform conditions of the solution and treatment at *all* times.

Most authors, researchers and shop operators agree that temperature of the bath, concentration of nickel salts, and degree of acidity or *p*H of the solution are of prime importance and must be controlled within rather narrow limits. In addition, such factors as time of immersion, sequence, and methods of rinsing before and after the nickel flash, interval of exposure to air between each step in the process, thickness of nickel coating, type of steel surface being treated and proper removal of sludge, all have important bearings on the quality of the resultant coating.

Time, Temperature and *p*H

Practices vary in detail, but most writers agree that with single nickel salts, a concentration of from ½ to 3 ozs. per gall. of solution, a *p*H of 5.4 to 6.2, a temperature of 150 to 180 deg. F. and a time cycle of 4 to 6 min. should be maintained, at least for blue ground coat application.

The important point is, when a set of conditions for the nickel flash sequences are once determined for satisfactory performance in any given shop under normal operation, those conditions should always be maintained within a practical narrow limit of variation.

Thus, if it is found that a temperature of 150 to 160 deg. F. for the solution gives the best deposit, always keep the temperature within this range. Never permit the temperature to rise to 190 deg. F. or fall to 130 deg. F., for example, even though some other shop may employ a higher or lower temperature. The same principle applies to variation in acidity, concentration and time of treatment, as *all* have an important bearing on both the nature and amount of deposit.

A heretofore little stressed, but, according to the researches of the Author's laboratory, important variable, is the kind and amount of iron salts deposited on the ware during the nickel flash and their degree of oxidation upon exposure to air. It is these salts which have a great bearing on the quality of white applied directly to the iron and undoubtedly have considerable

*A Paper presented before the Seventh Annual Forum, Porcelain Enamel Institute, Inc., Ohio State University, Columbus, Ohio.
†Italics are Author's.

Nickel Dipping

influence on the quality of blue ground coat over a nickel-flashed surface.

Experimental and Discussion

The brown and black specking which often appears in clusters of small spots and sometimes as larger spots resembling metallic copper when white porcelain enamels are applied to the metal have been found to be produced by a deposit of iron salts which covered the sheet after completing its sequences of preparation, including nickel flash, for porcelain enamelling. The effects of salts on direct application of white porcelain enamel can easily be demonstrated upon removing the deposit from one-half of a treated sheet by wiping free of salts with a clean cloth, and finishing the entire surface. In every case this has been tried, the specking has been effectively eliminated over that part of the surface rubbed free of the salt deposit.

It was observed that steel samples which were nickel flashed were invariably coated with a heavier deposit of iron salts than those samples not nickel flashed, but otherwise receiving identical treatment. This indicated that the nickel treatment contributed in some manner to the iron salt deposition, but was not the sole factor. Variables of treatment, including temperature of acid bath, nickel and neutraliser solutions; effect of scrubbing the surface under water; pickling and nickel flash time as well as *p*H of the nickel solution were studied in relation to the effect on this iron salt deposit.

No noticeable differences in the amount of iron salt deposition could be noted as a function of the solution temperatures employed.

A series of samples from a titanium bearing enamelling stock were given a standard cleaning and pickling treatment modified to the extent that after each of the three main operations one sample was removed and scrubbed with a brush under running hot water before placing in the next step of the series. The results are tabulated below:—

(1) Scrubbed after cleaner—salt deposit.
(2) Scrubbed after acid pickle—salt deposit.
(3) Scrubbed after nickel flash—no salt deposit.

These data indicate that the nickel dip operation contributes markedly to salt deposition. However, the other steps in the preparation of the metal surface for porcelain enamelling are not excluded as contributing factors. Sometimes white applied directly to steel will show black specking as well as brown spotting, or often the specks will be almost entirely black. It was assumed that black specking of white applied directly to special steels and amount of salts on the metal surface are directly related. This is evidenced by the fact that removal of the salt deposit by wiping as already described eliminates black specking as well as the typical brown spotting. On the series of tests described in Table I, bond was determined by impact.

Results may be summarised as follow:—(1) Black specking is directly proportional to pickling time; (2) black specking is directly proportional to nickel flash time; (3) in all cases where bond was obtained, no variation in degree of black specking could be noted as a function of the *p*H of the nickel solution; and (4) bond is inversely proportional to the acid pickling time.

Effect of weak acid bath following nickel dip: Immersing samples for 5 and 10 min. in a 1 per cent. sulphuric-acid solution (*p*H 1.3) after the nickel dip and before neutralising effectively and completely prevented the formation of insoluble, or non-rinsing rusty salts deposit and the sheets could be coated with white porcelain enamel applied to the iron with no black or brown specking. Later experiments showed that, with the practices recommended in this Paper, a rinse of *p*H 3.0 (about 0.002 per cent. H_2SO_4) is effective. This slight acidity prevents the hydrolysis of the iron salts to insoluble form.

Analysis of samples of salt deposit removed from steel sheets showed it to contain both iron and nickel, with only a trace of sulphate present. Thus, it was inferred that the salt deposit is a mixture of iron and nickel hydroxide, the iron being in the ferric state.

The fact that black and brown specking can be reduced to a minimum by (1) scrubbing the surface of the sheets following the nickel treatment; (2) wiping off the salt deposits; or (3) by dissolving off in a weak acid bath indicates that the cause of black specking is a surface effect and is related to the accumulation of iron salts which occurs for the most part after the nickel flash.

Removal of Iron-salt Deposits from Steel

Experimental work with sodium cyanide neutraliser solutions at various temperatures proved that the type of iron salts causing trouble cannot be dissolved by sodium cyanide. This suggested that cyanide is only effective in eliminating ferrous salts and that, if all salts could be reduced to the ferrous state, a cyanide neutraliser should be effective in their complete removal.

Experimental work demonstrated that ammonium oxalate, citric acid, ammonium citrate and tannic acid were effective in removing the iron-salt deposit from the steel. It is to be noted that all these materials are reducing agents and that, of the ferric salts, only ferric oxalate is soluble in sodium cyanide. Further experimentation with an ammonium oxalate rinse after the nickel flash and a subsequent immersion in sodium-cyanide neutraliser showed conclusively that when the steel was placed immediately in the neutraliser after removal from the oxalate rinse, no residual salts were in evidence, but if allowed even partially to dry between these steps, salt deposits remained on the sheet.

Importance of the Foregoing Experiments in Relation to Recommended Pickle Room Procedures

It is obvious from the discussion of the experimental work that much of the difficulty encountered with a nickel flash step in the pickle room results from oxidised iron salts that form on the surface of the steel and that the severity of the difficulties are directly related to the degree of their oxidation. It has been shown that these salts are not only influenced by time, temperature and concentration of the baths, but that the time intervals between immersion in the various baths are of extreme importance. The ideal system would be one that required no time interval whatsoever between baths or in which the ware would be exposed only to a neutral

atmosphere. Since neither condition is economically possible, some compromise must be met.

It has been shown that weak sulphuric acid is effective in removing the salts and that some salts are formed between the acid and nickel operations when a neutral water rinse after acid is used. Therefore, it would seem reasonable that a weak acid rinse would be in order, since this prevents the formation of ferric salts (hydroxide).

Since ammonium oxalate is expensive, it is inadvisable for plant use if a scheme can be found to eliminate the formation of ferric salts between the nickel flash and the neutraliser. A weak acid rinse is effective at this

TABLE I.—*Tendency to Black Speck After Nickel Dip.*

Acid pickle time.	Nickel dip time.	*p*H of Ni solution.	Bond front.	Back.	Blackspecking tendency.
5	5	2	Poor	Poor	Very slight.
5	5	4	Good	Good	General and quite heavy
5	5	5	,,	Poor	,, ,,
5	5	6	,,	Good	General ,, ,,
5	5	7	,,	,,	General and quite heavy
4	6	3.5	,,	,,	Slight
8	6	3.5	,,	,,	General and quite heavy
12	6	3.5	,,	Poor	,, ,,
16	6	3.5	,,	,,	,, ,,
6	5	3.5	,,	Good	Very slight
6	10	3.5	,,	,,	General and quite heavy
6	15	3.5	,,	,,	,, ,,
6	20	3.5	,,	,,	,, ,,

point also, but it has been found more effective to eliminate the rinse entirely and transfer the ware directly from a nickel flash tank to a cyanide neutraliser with a minimum of exposure to air in the process.

This appears to be contrary to the statement of Wainer and Baldwin[5] to the effect that "adequate rinsing between nickel flash and neutraliser is thus indicated as a requirement," but it should be recognised that Wainer and Baldwin were using double nickel salts, boric acid as a buffer, and a *p*H mostly near 6.2. All three conditions act to promote excessive formation of iron salts, and hence their recommendation is correct.

The results of the experiments referred to in this Paper and the general experience of laboratory daily procedures indicate that, where such conditions exist, an acid rinse of at least *p*H 3.0 should be used instead of hot water; but for best results, single nickel salts, no boric acid buffer and *p*H 3.5 should be maintained in the nickel flash tank. Under these conditions the formation of the iron salts is kept to a minimum and under most conditions no rinse is required between the nickel flash and the neutraliser.

Pettyjohn[1] and Hansen[2d] have stressed the importance of, and methods for, removal of sludge from the nickel tank. Pumping the solution continuously through a small, non-ferrous filter press is an excellent method for maintaining clear solutions.

However, by maintaining the nickel solution at *p*H 3.5 the tendency to form this sludge is greatly minimised. Most of the sludge comes from the oxidation of the iron in the soluble salts to the ferric state, which then hydrolyse to the insoluble ferric hydroxide when the *p*H is kept in the earlier recommended range of 5.4—6.2.

If there is a tendency to build up too much sludge in the neutraliser by omitting the rinse between the nickel flash and the neutraliser, then an acid rinse of *p*H 3.0 can be used. The use of two neutraliser tanks is effective in assuring completely neutralised ware. The first tank should be changed frequently. The improved results usually justify the expense of increased consumption of neutraliser.

Another method for improving the neutraliser, especially when the nickel rinse is omitted, is to use a continuous filter system for the first neutraliser tank. An iron filter system can be used.

Recommended Sequence for Nickel Flash

Large-scale production procedures as well as research have shown the following conditions and sequence of operation to give effectively nickelled steel without the attendant dangers of iron salts:—

(1) After the acid pickle—5-min. rinse in sulphuric acid of *p*H at room temperature.

(2) Nickel dip—time is variable to suit plant conditions. Solution should contain from ¾ to 1½ ozs., preferably 1-oz. single nickle salts per gall. Maintain acidity at *p*H 3.5 with addition of sulphuric acid or sodium hydroxide. Do not use boric acid as a buffer, as this promotes excessive formation of complex iron salts. Ammonia and ammonium carbonate additions should be avoided for the same reasons. Temperature of the bath should be 155 deg. F.

(3) Do not use a rinse, but if it is felt absolutely necessary, a short rinse in sulphuric acid of *p*H 3.0 is effective. The time interval between the nickel flash and the rinse, as well as between the rinse and the neutraliser should be extremely short.

(4) Two neutraliser tanks should be available, the first made up in fairly strong solution and the second weaker. Suggested conditions are:—

(*a*) 0.4 oz. per gall. sodium cyanide; 0.2 oz. per gall. sodium hydroxide; temperature, 140 deg. F.; time, 1½ min. immersion.

(*b*) 0.12 oz. per gall. sodium cyanide; 0.10 oz. per gall. sodium hydroxide; temperature, 140 deg. F.; time, 2½-min. immersion.

Carbonates should be avoided in the neutraliser, since these has been found to hinder the cyanide removal of the ferrous salts.

Acknowledgment

The writer wishes to acknowledge the contribution of the research staff members of Ferro Enamel Corporation, Mr. B. J. Sweo and Mr. E. B. Bryant, who conducted and reported on the investigations discussed in this Paper.

REFERENCES

1 James Pettyjohn, "Nickel Dip Treatment of Enameling Iron," Proceedings of the Second Forum, Porcelain Enamel Institute, 56 (1937).

2*a* Joint Committee of Frit and Porcelain Enameling Sheet Manufacturers, "Preparation of Metal for Porcelain Enameling" (1944).

2*b* J. E. Hansen and J. T. Irwin, "The Use of a Nickel Dip in Enameling Practice." *Journal American Ceramic Society*, 18 (8). 225-229 (1935).

2*c* Karl Kautz, "Double *v.* Single Nickel Salts in Nickel Dipping Practice." *Enamelist*, 15 (4), 13-15 (1938).

2*d* J. E. Hansen, "A Manual of Porcelain Enameling." The Enamelist Publishing Co., Cleveland, Ohio, pages 345-347 (1937).

2*e* J. M. Zander, "Factors Affecting Rate of Nickel Depositions in Nickel Plating." *Better Enameling*, 9 (6), 5-8 (1938).

5 E. Wainer and W. J. Baldwin, "Nickel Flashing and Its Relation to Enamel Adherence." *Journal American Ceramic Society*, 28 (11), 317-326 (1945).

NEW METHOD OF MAKING APPEALS FOR WAR DAMAGE

By F. J. TEBBUTT

Under the War Damage Acts, compensation for war damage may be either (*a*) a "cost of works payment," or (*b*) a "value payment." Ordinarily (*a*) applies where premises are repairable, and (*b*) otherwise. That is for clear cases, but for other cases there must be an appraisement as to whether a "total loss" is indicated, and it must be noted that this term does not apply in its physical sense but in an economic sense, the position being that if putting the premises into the state they were in before the war damage would cost more than would result from a "value payment" (taking both cost of repairs and values as at March 31, 1939), thus a "total loss"—a "value payment" must be scheduled. Incidentally, a "value payment" is roughly the difference between the value of the hereditament before and after the war damage. But when a "cost of works" payment is made the figures for the appraisement will not necessarily be the amount payable, the actual payment will be based on the building costs, etc., at the date the job is done; on the other hand, by the main Acts a "value payment" is to be the value as at March 31, 1939. By Government statements it appears that value payments generally are not likely to be made for some time yet.

Appeal Tribunals

By the Principal Acts, appeals from a determination of the War Damage Commission as above were to be made to one of a panel of Referees appointed under the Finance Act (1909-10), but there has been too much work otherwise for these panel members, delaying determinations on war damage questions. The War Damage (Valuation Appeals) Act, 1945, therefore alters this procedure, and a special panel is constituted, from the members of which (numbers decided and members appointed by the Lord Chancellor) tribunals will be formed to decide appeals, the president of the panel selecting the members to constitute the particular tribunal. The panel is composed of barristers of at least seven years' standing (this applies to the president, likewise), and of persons experienced in valuation matters appointed after consultation with the president of the Chartered Surveyors' Institution, that is, partly barristers and partly valuers.

Damage to Proprietary Interests

Apart from appeals, other matters (which previously went to the Referees mentioned) will go before a tribunal under this new Act, these being matters where there has been disagreement between the parties, as to the proportionate damage to different proprietary interests, questions between owners and lessees, mortgage and rent charge matters, and so on.

Appeals from a determination of a tribunal can be made to the High Court or to a County Court where the case concerns a valuation not exceeding £500 per annum, or a rent charge not exceeding £25 per annum.

METHOD OF ARC-WELDING CAST IRON

An item of interest mentioned in a Report [H.M. Stationery Office (Price 1s.)] on "Welding in German Shipyards," obtained by permission of Combined Intelligence Objective Sub-Committee, is a metallic arc-welding method used for cast iron. The smallest size electrode used was of 6 mm. square cross-section with a small, flux-filled groove running lengthwise on one side. This electrode was used at approximately 300 amps. For applications where large quantities of metal were to be deposited, circular cross-section electrodes of 9-mm. and 12-mm. dia. were used at about 600 and 1,000 amps. respectively. The flux was not incorporated into these larger electrodes, but was added during the welding in powder form. Work was preheated to between 300 and 400 deg. C. The process was used not only for repairing broken castings by groove welding, but for building up castings such as large broken-off corners.

GERMAN TECHNICAL REPORTS

The latest reports of interest to the foundry industry contained in the lengthy list made by the Commissions visiting Germany, are as follow:—

CIOS XXVIII-64, Fried-Krupp A.G. Grusonwerke, Magdeburg. Ironfoundry. (Post-free price, 7d.). CIOS XXX-55, ferro-alloy production. Badische Wolframerz G.m.b.H. Sollingen. (7d.). CIOS XXXI-42, high-quality steel castings. Ruhrstahl A.G., Annen. (1s. 7d.). CIOS XXXI-46, special alloy steel manufacture, and centrifugal casting of alloy tubes and gun barrels. (1s. 7d.). CIOS XXXI-73, Vereingte Leichmetall Werke, G.m.b.H., Hanover Linden. Processing of aluminium, magnesium and alloys. (2s. 8d.). CIOS XXXII-55, recovery of metals from scrapped airplanes. (1s. 7d.). BIOS 253, production of silumin alloys, Horrem. (2s. 8d.). FIAT 160, sewing machinery. (1s. 1d.). BIOS 289, report on German textile machinery firms. (1s. 1d.). BIOS 316, German light alloy foundry industry. (2s. 1d.).

BRITISH DELEGATES AT THE A.F.A. JUBILEE CONVENTION

The following is the list of the members of the Institute of British Foundrymen party, which left for America last week to attend the A.F.A. Jubilee Convention at Cleveland:—

G. W. Bush, Renshaw Foundry, Limited, Staines; J. Dearden, L.M.S. Railway Company, Limited, Derby; V. Delport, A.F.A. European representative, London; B. Gray, English Steel Corporation, Limited, Sheffield; A. Jackson, Garton & King, Limited, Exeter; T. Lee, Henry Hollingdrake & Son, Limited, Stockport; T. Makemson, M.B.E., Ministry of Supply, I.B.F. Secretary; D. W. L. Menzies, The North British Steel Foundry, Limited, Edinburgh; F. W. Nield, Henry Wallwork & Company, Limited, Manchester; E. Owen, Walmsleys (Bury), Limited; T. Shanks, Cruikshank & Company, Limited, Denny; F. E. Tibbenham, Suffolk Iron Foundry (1920), Limited, Stowmarket.

INSTITUTE OF BRITISH FOUNDRYMEN

ANNUAL CONFERENCE IN BIRMINGHAM

The 43rd annual Conference of the Institute will be held at Birmingham from June 18 to 21, 1946, and is being arranged by the Birmingham, Coventry, and West Midlands branch.

Programme

Tuesday, June 18.—Council and Committee meetings, open to Committee members only, will be held during the afternoon. At 7.45 p.m. buses depart from Grand Hotel for the reception by the Birmingham branch at the Botanical Gardens, Edgbaston. This is from 8.15 p.m. until midnight. Buses will be available to convey guests to their hotels from 11.30 p.m. to midnight.

Wednesday, June 19.—The annual general meeting at the Grand Hotel, Birmingham, commences at 9.30 a.m. The presentation of awards is followed by the presidential address by Mr. D. H. Wood. At noon the Conference adjourns. Buses depart from the Grand Hotel for the Botanical Gardens for luncheon.

At 2 p.m. the Edward Williams Lecture, "Fabrication and Castings," is to be delivered by Sir Claude D. Gibb, C.B.E., M.E., M.I.Mech.E. (C. A. Parsons & Company, Limited), at the Grand Hotel. Technical sessions will be held at the Grand Hotel, commencing 3.15 p.m. (Session A, Papers Nos. 846, 847; and Session B, Papers Nos. 849, 850, 851). The Conference adjourns at 5.30 p.m. Buses depart from the Grand Hotel for Stratford-on-Avon at 5.45 p.m. A limited number of seats at the Shakespeare Memorial Theatre have been booked, and arrangements made for a limited number of members and ladies (the ladies will be visiting Stratford in the afternoon) to dine at the Shakespeare Gallery Restaurant at 6.30 p.m. Tickets for the theatre and dinner are available from the Institute. The play will be "Henry V," and will commence at 7.30 p.m. Buses will be available for return to Birmingham after the theatre.

Thursday, June 20.—Technical Sessions at the Grand Hotel commence at 9.15 a.m. (Session C, Papers Nos. 848, 853; and Session D, Papers Nos. 854, 855, 852, 856). The Conference adjourns at 12.15 p.m. and buses depart from the Grand Hotel for the Botanical Gardens for luncheon. Buses will also leave the Grand Hotel at 1.30 p.m. to enable members who may make their own arrangements for luncheon to connect with the following works visits:—(1) W. & T. Avery, Limited, Soho Foundry, Birmingham (weighing and testing machine makers); (2) Sandwell Casting Company, Limited, West Bromwich (copper-base alloy founders); (3) British Piston Ring Company, Limited, Holbrook Lane, Coventry (piston and piston-ring manufacturers); (4) the Mond Nickel Company, Limited, Research Laboratories (research laboratories and precision casting); (5) Thos. Perry, Limited, Highfield, Bilston, Staffs, and C. Akrill, Limited, Gold Green Foundry, West Bromwich (roll makers); (6) Coneygre Foundry, Limited, Tipton (batch production foundry; automobile castings). As each visit occupies the whole afternoon, a member may join only one of the visits (1) to (6) above. On return, buses will arrive at the Grand Hotel at about 5 p.m.

At 6.45 p.m. is the reception by the President and Mrs. Wood, prior to the annual banquet, which commences at 7.15 p.m. at the Grand Hotel. This is followed by dancing until 1 a.m. (members and ladies). Evening dress is preferred. Buses will be available to convey guests to their hotels from midnight to 1 a.m.

Friday, June 21.—At 9 a.m. buses will depart from the Grand Hotel for the following works visits:—(7) Austin Motor Company, Limited, Longbridge Works (automobile foundry), and British Cast Iron Research Association Laboratories, Alvechurch; (8) Humber, Limited, Coventry (automobile foundry), and Morris Motors, Limited, Engines Branch, Coventry (automobile foundry); (9) Alfred Herbert, Limited, Coventry (machine tools), and Imperial Foundry Company (Ford Motor Company, Limited), Leamington Spa (automobile foundry); (10) mechanised foundries of John Wright & Company, Limited (proprietors, Radiation, Limited), Essex Works, Aston, and F. H. Lloyd & Company, Limited, James Bridge Steel Works, Wednesbury (steel-founders); (11) Birmingham Aluminium Casting (1903) Company, Limited, Smethwick (light alloy founders). Each of the above visits (7) to (10) will occupy the whole day. In each case the first-named company will be visited in the morning and will kindly provide the party with luncheon. The buses will convey members direct to the second-named works in the afternoon. It will not be possible for any member to transfer from one party to another. If any member does not wish to join an afternoon visit, it will be necessary for him to make his own transport arrangements back to Birmingham. Similarly, if any member wishes to join only an afternoon visit, he should make his own transport arrangements to the works and should arrange to arrive there not later than 2.30 p.m. in each case. Visit No. (11) will occupy the morning only; luncheon will be provided at the invitation of the company, after which buses will return to the Grand Hotel. Buses will arrive at the Grand Hotel at about 5 p.m. At 7.15 p.m. buses depart from the Grand Hotel for a reception, at 8 p.m., at "Cotswold," Barnt Green, by kind invitation of the President and Mrs. Wood. Buses will be available at 10 p.m. to convey members to their hotels.

Ladies' Programme

Tuesday, June 18.—At 7.45 p.m. buses depart from the Grand Hotel for a reception by the Birmingham branch at the Botanical Gardens, Edgbaston (all members and ladies). Evening dress is preferred. The reception is from 8.15 p.m. to midnight, when buses will be available to convey guests to their hotels.

Wednesday, June 19.—Coffee, Kunzle's Cafe, Union Street, at 10.45 a.m., at the invitation of the ladies committee of the Birmingham branch. At noon, buses depart from the Grand Hotel to convey members and ladies to the Botanical Gardens for luncheon at 12.40 p.m.

Buses depart from the Botanical Gardens at 2 p.m. for a visit to Stratford-on-Avon. Tea will be taken at the Shakespeare Gallery Restaurant, at 3.45 p.m. After tea, ladies may either return direct to Birmingham (evening free) in the buses provided, or, alternatively,

Institute of British Foundrymen

remain in Stratford-on-Avon to attend the performance of "Henry V" at the Shakespeare Memorial Theatre.

Thursday, June 20.—At 10.15 a.m. buses depart from the Grand Hotel, Birmingham, for a sightseeing visit to Worcester. Luncheon is at the Court Room, Worcester Guildhall (by kind permission of the Mayor of Worcester), and is at 1 p.m. Buses depart at 2.15 p.m. for Harvington Hall, where tea will be taken and thence return to the Grand Hotel, Birmingham, arriving not later than 5 p.m. At 6.45 p.m. is the reception by the President and Mrs. Wood prior to the annual banquet.

Friday, June 21.—At 10 a.m. buses depart from the Grand Hotel for a visit to Evesham. Steamer trip on River Avon. At 1 p.m., luncheon at the Avon Bridge Tea Rooms and River Gardens. Buses leave Evesham for Broadway at 2 p.m. Tea is at St. Patrick's Tea Room, Broadway, at 3.45 p.m. Buses should leave at 4.30 p.m. and arrive at the Grand Hotel, Birmingham, at 5.30 p.m. At 8 p.m. is the reception at "Cotswold," Barnt Green.

Papers to be Presented

No. 846, "Control Tests for Grey Cast Iron," by Sub-committee T.S.6 of the Technical Council.

No. 847, "Fluidity of Molten Metals," by K. L. CLARK, Naval Research Laboratory, Washington, D.C. (American Foundrymen's Association Exchange Paper).

No. 849, "The Influence of Raw Material on the Properties of Whiteheart Malleable Cast Iron, with Special Reference to the Influence of Residual Elements," by the Malleable (Metal Compositions) Sub-committee of the Technical Advisory Panel to the Director for Iron Castings, Ministry of Supply.

No. 850, "The Annealing Rate in Gaseous Malleablising," by D. M. DOVEY, M.A., and I. JENKINS, M.Sc. (member), General Electric Company, Limited.

No. 851, "Note on the Process of Gaseous Malleablising, with Especial Reference to the Use of Steam," by D. M. DOVEY, M.A., General Electric Company, Limited. Papers 850 and 851 will be discussed together.

No. 848, "Standard Test-bars for the Non-ferrous Foundry," by F. HUDSON (member), the Mond Nickel Company, Limited.

No. 853, "The Production of 'Grand Slam' Bomb Castings," by B. GRAY, B.A. (Cantab.) (member), English Steel Corporation, Limited.

No. 854, "Hot-blast Cupola Design," by E. LONGDEN, M.I.Mech.E., P. R. Jackson & Company, Limited.

No. 855, "Experiences with Balanced Air Feed in the Cupola," by T. H. TAFT (member), Idoson Motor Cylinder Company, Limited, and H. A. HALLETT (member), Metronic Instrument Company, Limited.

No. 852, "Some Observations on Iron and Steel Castings Specially Resistant to Wear," by M. BALLAY, Docteur es-sciences, Centre d'Information du Nickel, and

(*Continued at foot of next column.*)

MACHINING ALLOWANCE

By "TRAMP"

The correct machining allowance on castings is one of those factors over which no hard and fast rule can be established. Practice varies from shop to shop and also according to the type of casting manufactured. Whereas for work of only secondary importance, when a face has only to be cleaned and is not required in any definite relation to any other within very fine limits, the minimum possible is satisfactory, but for work carrying a number of cores and where numerous faces have to clean up to within plus or minus three or four thousandths, it is necessary to be rather generous with machining allowance, as there may be slight discrepancies in the casting which necessitate its being "thrown" to ensure certain faces cleaning up, especially after the pattern equipment has been in use a considerable while. Actually it is always wise before commencing the pattern, for any complicated work, to get the machinist and foundryman to agree as to the machining allowance desirable on the casting, for invariably, unless this is agreed, the machinist complains of lack of metal here, or too much there, on receipt of the castings.

Modern high speed tipped tools can remove metal at a very fast rate, and it is always wise to err on the side of too much to remove, than not enough. A particular case is remembered by the writer which concerned a fairly lumpy cylinder casting, about 20 in. in diameter, which also carried a number of facings for carrying pieces of the mechanism and which had to be correct to size. The foreman pattern-makers gave instructions that the casting was to carry $\frac{1}{4}$ in. machining allowance in the core and on each face. Consequently the pattern-maker constructed the pattern, the casting was produced and despatched to the customer, who promptly demanded an increased allowance on subsequent castings in the cylinder bore, and said that the time wasted in marking off this particular casting to ensure all faces cleaning was more costly than taking a heavier cut off the various machined surfaces. The design of this particular casting was such that slight distortion took place on cooling, thus aggravating the position. When the increased allowance was added no further complaints were received, the production of these cylinders being very considerable.

INSTITUTE OF BRITISH FOUNDRYMEN

(*Continued from previous column.*)

R. CHAVY, Ingenieur diplome, Ecole Superieure de Fonderie, Paris (French Foundrymen's Technical Association Exchange Paper).

No. 856, "Heat-treatment of Grey Cast Iron for Relief of Internal Stress," by P. A. RUSSELL, B.Sc. (member), S. Russell & Sons, Limited.

No. 857, "The Estimation of Gas Content in Sand Cores," by Sub-committee T.S.13 of the Technical Council.

No. 858, "Second Report on Basic Cupolas," by Sub-committee T.S.10 of the Technical Council.

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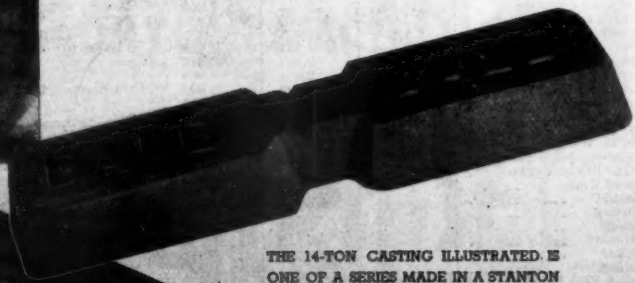

THE 14-TON CASTING ILLUSTRATED IS ONE OF A SERIES MADE IN A STANTON FOUNDRY FROM STANTON DALE IRON

1. Core being lowered into mould
2. Pouring the metal
3. Finished casting in transit

The STANTON IRONWORKS COMPANY LIMITED
NEAR NOTTINGHAM

IMPORTS AND EXPORTS OF IRON AND STEEL

BOARD OF TRADE RETURNS FOR MARCH

The following tables, based on Board of Trade returns, give figures of imports and exports of iron and steel in March and in the first three months of 1946. Figures for three months of 1938 are given for purposes of comparison.

Total Exports of Iron and Steel

Destination.	March, 1946.	Three months ended March.	One-quarter of 1938.
	Tons.	Tons.	Tons.
Eire	5,100	17,992	13,930
Channel Islands	286	1,265	1,854
Palestine	6,797	19,334	2,018
British West Africa	2,786	11,323	12,436
Union of South Africa	28,221	61,507	57,772
Northern Rhodesia	896	1,189	5,144
Southern Rhodesia	13,497	20,173	9,053
British East Africa	3,064	6,260	6,483
British India	7,120	21,558	39,670
Burma	1,464	4,374	4,628
British Malaya	1,383	7,603	16,646
Ceylon	1,041	2,404	6,508
Hong Kong	2,067	4,639	5,899
Australia	764	2,946	42,726
New Zealand	3,786	11,030	32,971
Canada	429	1,435	21,352
British West India Islands	2,029	5,161	11,063
Anglo-Egyptian Sudan	1,252	2,908	2,073
Other British Countries	1,369	5,279	5,485
Soviet Union	—	—	1,087
Finland	3,991	9,935	4,402
Norway	5,983	22,281	5,068
Iceland	422	1,962	165
Denmark	23,081	48,872	21,814
Poland	303	754	622
Netherlands	17,022	48,822	12,890
Dutch East Indies	—	—	6,827
Dutch West India Islands	97	3,654	616
Belgium	1,590	10,203	5,081
France	5,612	20,329	3,347
Portugal	4,567	12,784	1,928
Portuguese East Africa	907	1,205	3,555
Spain	1,270	3,103	1,941
Italy	70	81	1,285
Greece	1	2,555	438
Turkey	1,457	3,609	3,439
Egypt	11,447	31,997	8,602
Iraq	6,186	14,176	6,435
Iran	11,011	27,703	27,595
China	426	480	5,533
U.S.A.	64	182	547
Venezuela	2,039	5,695	1,169
Ecuador	52	606	398
Chile	112	883	1,573
Brazil	4,506	14,841	4,248
Uruguay	92	1,546	1,897
Argentine	6,126	18,065	19,839
Other Foreign Countries	15,221	47,414	28,929
Total	207,006	562,117	478,969

THE "NICKEL BULLETIN" for March, devotes generous space to cast iron and abstracts four articles covering this subject. A very interesting account is given of "Minvar"—a low expansion nickel cast iron. Heat and corrosion-resisting alloys also receive extensive treatment. Copies are available to our readers on writing to the Mond Nickel Company, Limited, Grosvenor House, Park Lane, London, W.1.

Total Imports of Iron and Steel

From	March, 1946.	Three months ended March.	One-quarter of 1938.
	Tons.	Tons.	Tons.
British India	1,965	7,209	38,908
Australia	2,000	15,803	9
Canada	9,786	34,665	29,344
Other British Countries	15	104	1,400
Sweden	287	564	22,449
Norway	109	2,063	8,444
Belgium	—	2,016	68,420
Luxemburg	—	—	14,650
France	—	60	64,337
U.S.A.	14,352	36,281	50,173
Other Foreign Countries	—	10	37,940
Total	28,514	98,775	336,068
Iron ore and concentrates—			
Manganiferous	—	6,900	15,571
Other sorts	567,508	1,440,392	1,275,468
Iron and steel, scrap and waste, fit only for the recovery of metal	29,859	85,415	158,051

Exports of Iron and Steel by Products

Product.	March, 1946.	Three months ended March.	One-quarter of 1938.
Pig-iron	390	452	23,485
Ferro-alloys, etc.—			
Ferro-tungsten	29	144	129
Spiegeleisen and ferro-manganese	4,400	18,679	1,299
All other descriptions*	161	351	262
Ingots, blooms, billets and slabs	166	403	2,436
Iron bars and rods	810	3,550	799
Sheet and tinplate bars	—	221	3,095
Wire rods and bright steel bars	2,963	9,563	2,442
Other steel bars and rods	18,435	65,380	25,503
Special steel	1,048	3,548	1,233
Angles, shapes and sections	13,941	37,998	16,851
Castings and forgings	225	557	405
Girders, beams, joists and pillars	11,932	23,971	8,368
Hoop and strip	7,563	20,742	9,344
Plates, ⅛ in. thick and over	31,574	79,679	32,742
Black plates	2,609	4,152	3,635
Black sheets	2,288	6,357	15,878
Galvanised sheets	1,747	3,270	36,734
Tinplates	7,505	23,472	79,830
Tinned sheets	164	380	353
Terneplates	45	175	1,081
Decorated tinplates	108	248	1,092
Cast-iron pipes, up to 6-in. dia.	1,945	8,455	12,232
Do., over 6-in. dia.	2,225	7,157	10,741
Wrought-iron tubes	22,065	61,768	54,993
Steel rails	23,671	53,604	26,500
Sleepers and fishplates	12,944	36,773	6,346
Other railway material	2,084	4,881	6,693
Wire	7,068	17,409	13,796
Wire manufactures	114,707	265,353	7,372
Nails, tacks, etc.	707	2,088	952
Rivets and washers	881	2,114	2,134
Wood screws	409	1,280	628
Bolts, nuts, and metal screws	1,794	5,180	4,393
Stoves, grates, etc.	630	1,531	2,288
Sanitary cisterns	91	197	703
Fencing material	631	875	1,283
Anchors, etc.	341	1,018	1,584
Chains	674	2,012	1,573
Springs	464	1,422	983
Hollow-ware	6,448	16,196	2,676
All other manufactures	11,121	28,953	54,115
Total	207,006	562,117	478,969

* The figures for 1946 are not completely comparable with those for earlier years.

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FOUNDRY HEATING . . .

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CC 21

NEWS IN BRIEF

AVELING-BARFORD, LIMITED, manufacturers of road machinery, dairy apparatus, etc., propose to increase their authorised capital from £650,000 to £850,000 by the creation of 800,000 ordinary shares of 5s. each.

TO THE FUND in memory of Sir Horace Darwin for re-equipping laboratories in enemy-occupied territories 12 member firms of the Scientific Instrument Manufacturers' Association of Great Britain have promised instruments to the value of £3,300.

THAT IT WILL eventually be possible to obtain a speed of over 1,000 m.p.h. using jet-propelled engines, is the conviction of Mr. H. Pearson, of Rolls-Royce, Limited, who addressed the Staff Society of Partridge, Jones & John Paton, Limited, Pontnewynydd, Mon.

AT AN extra-ordinary meeting of the Brush Electrical Engineering Company, Limited, recently, a resolution was passed authorising the board to borrow up to £1,750,000 or the amount of the paid-up capital, whichever is the greater, in lieu of the present maximum of £750,000.

JOHN CROWN & SONS, LIMITED, Sunderland, have been taken over by Joseph L. Thompson & Sons, Limited, also of Sunderland. Both shipbuilding and ship-repairing will continue to be undertaken by Messrs. Crown & Sons, who are the second oldest shipbuilding firm on the Wear, being founded in 1807.

MR. A. ROEBUCK, works director, and Mr. W. Jenkins Gibson, financial director, of Hadfields, Limited, Sheffield, have left this country for a business tour of Canada and the United States. They have taken with them the film "The Manufacture of Quality Steel," which has been widely shown in this country.

AN APPEAL to the Government to make available to British manufacturers of scientific instruments and laboratory equipment adequate supplies of labour to help meet urgent home and export requirements is made by Mr. Norman Sheldon, chairman of the British Chemical Ware Manufacturers' Association, in a letter published in "The Times."

THE GRAHAMSTON IRON COMPANY, LIMITED, Falkirk, have sold the former works of the Summerford Iron Company, Limited, whose capital they acquired in 1937, to J. K. Millar, Limited, manufacturers of synthetic stone, Parkhouse Works, Falkirk, who are to use the premises for the production of pre-cast materials for house-building.

SIR CLIVE BAILLIEU, in his presidential address to the Federation of British Industries, which was circulated in advance of the recent annual meeting, said it was of over-riding importance that industry devote energies and resources to the struggle for ever greater output and further improvement of our technical and managerial efficiency. It was in 1946 that we had to lay the foundations on which our future would depend for many years to come. Much would depend on the decision of the United States Congress regarding the loan which had been negotiated as a means of tiding us over the next two years.

OBITUARY

MR. JOHN WHITTAKER, chairman of Jas. C. Kay & Company, Limited, iron and brass founders, of Prettywood, Bury, died recently.

MR. JOHN ROWLAND TORRANCE, who died recently, was a director of Stothert & Pitt, Limited, crane and pump makers, ironfounders, etc., of Bath.

MR. WILFRED S. RICHARDS, managing director of W. Richards & Sons, Limited, iron and steel rollers, ironfounders, etc., of Middlesbrough, has died after a long illness.

MR. WILLIAM MORRISON, managing director of William Morrison & Sons (Leith), Limited, manufacturers of paper machinery, wire cloth, etc., has died in his 95th year. He entered the firm, which was founded by his father, about 70 years ago.

MR. A. K. SOWTER, who died recently, was from 1916 to 1926, a works manager with R. & H. Green & Silley Weir, Limited, ship-repairers, foundrymen, etc., of Leadenhall Street, London, E.C.3. In 1926 he commenced practice as a ship surveyor in London.

MR. ARTHUR ROBINSON, a director of Simon-Carves, Limited, Cheadle Heath, Stockport, has died suddenly. He joined the company in 1903 and was put in charge of the washery department in 1919. He continued to direct this department until his retirement from active management on account of ill-health at the end of June, 1945.

EFFECT OF STEEL NATIONALISATION ON SHIPYARDS

Sir Percy Bates, the retiring chairman, declared at the annual meeting of the Liverpool Steamship Owners' Association at Liverpool on April 25 that the notice given by the Government of the intention to nationalise an indefinite portion of the iron and steel industries was hardly likely to increase the flow of steel, so it might be that the new ships would be delayed. By all accounts the shipyards in general had orders to last two years, and it came as a surprise to him to learn that some at all events were not receiving more than three-quarters of their weekly steel requirements.

Most of us had got used to not having enough coal and, indeed, on a strict balance to-day the country must be importing fuel, he said. But to find a shortage of shipyard steel was rather startling, and made one glad to remember that materials imported for shipbuilding were free of any import duty.

CONTRACT OPEN

Any date given is the latest on which tenders will be accepted. The address is that from which forms of tender may be obtained.

Nottingham, May 20—Cast-iron pipes, castings, gunmetal fittings, etc., for the 12 months ending June 30, 1947, for the Corporation. Mr. B. W. Davies, engineer and general manager, Water Department, Castle Boulevard, Nottingham.

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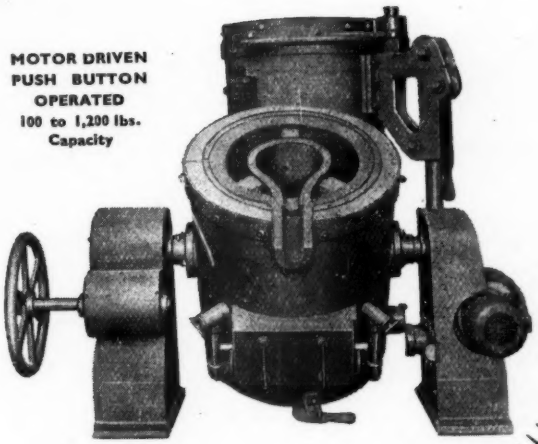

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COMPANY RESULTS

(Figures for previous year in brackets.)

A.C.E. Machinery—Net profit for the year ended September 30, £8,446 (£10,978); dividend of 15% (same); forward, £5,083 (£6,325).

Halesowen Steel—Net profit for 1945, £26,096 (£17,513); ordinary dividend of 20% (same); bonus, nil (2½%); forward, £21,255 (£21,284).

British Lead Mills—Trading profit for the year ended October 31, 1945, £32,200 (£28,663); dividend of 30% (10%); forward, £7,980 (£11,041).

Churchill Machine Tool—Net profit for 1945, £66,232 (£65,909); final ordinary dividend of 15%, making 30% (same); forward, £38,851 (£37,765).

Smith & McLean—Profit for 1945, £50,572 (£51,177); to reserve, £10,000 (same); dividend of 11% (same), plus bonus of 4% (same); forward, £120,154 (£97,862).

Millom & Askam Hematite Iron—Profit for 1945, after taxation, £76,847 (£85,250); written off fixed assets, £20,000 (£25,000); dividend of 10% (same); forward, £46,518 (£46,277).

Benton & Stone—Profit for the year ended August 4, 1945, £63,090 (£54,688); final dividend of 10%, tax free, making 15% (same); to general reserve, £5,000 (£20,000); forward, £11,206 (£7,509).

British Steel Constructions (Birmingham)—Profit for the year to August last, £23,158 (£18,246); to taxation, £14,062 (£9,007); to general reserve, £8,000 (£2,000); dividend of 7½% (15%); forward, £2,032 (£5,813).

Lancashire Steel Corporation—Profit for the year ended October 31, 1945, after taxation, £649,178 (£591,061); dividend on the "A" and "B" ordinary shares of 7% (same); forward, £88,221 (£88,047).

Ideal Boilers & Radiators—Net profit for 1945, after £95,756 (£134,318) for taxation, £74,845 (£80,810); over-provision for tax in preceding years, £33,607 (£26,000); final dividend of 2½%, tax free, making 10%, tax free (same); forward, £239,864 (£226,412).

Tharsis Sulphur & Copper Company—Net loss for 1945, £2,594, after writing off £25,944 for depreciation. This loss, added to the debit balance of £18,609 brought forward from the previous year, makes a total debit of £21,203 to be carried forward.

Wallsend Slipway & Engineering—Profit for 1945, £168,027 (£143,504); final dividend of 3% on preference shares, making 6%; final ordinary dividend of 13%, making 20%; bonus of 10%; to general reserve, £50,000 (£30,000); forward, £37,103 (£34,881).

Vosper—Net trading profit to August 31, 1945, £55,767 (£55,080); to bank charges, £16,455 (£15,040); depreciation, £11,751 (£11,534); net profit, £24,735 (£25,273); to tax, £14,875 (£17,471); contingencies, £3,500 (£1,500); dividend of 10% on ordinary and deferred shares (same); forward, £19,956 (£20,471).

P. & W. Maclellan—Profit for 1945, including estimated E.P.T. recoverable after provision for income-tax and contingencies, £49,882 (£55,497); interest on debentures, £6,561 (same); depreciation, £10,000 (same); reserve fund, £10,000 (same); deferred repairs, nil (£5,000); dividend of 6% (same); forward, £9,271 (£8,970).

Wilkes Berger Engineering—Net profit for 1945, £31,420 (£59,597); dividend from subsidiary, nil (£10,000); tax, £15,488 (£50,912); deferred repairs, nil (£2,000); preference redemption reserve, £3,750 (£3,600); preference dividend, £1,184 (£1,280); ordinary dividend of 15% (same) and bonus of 5% (same); forward, £22,276 (£21,378).

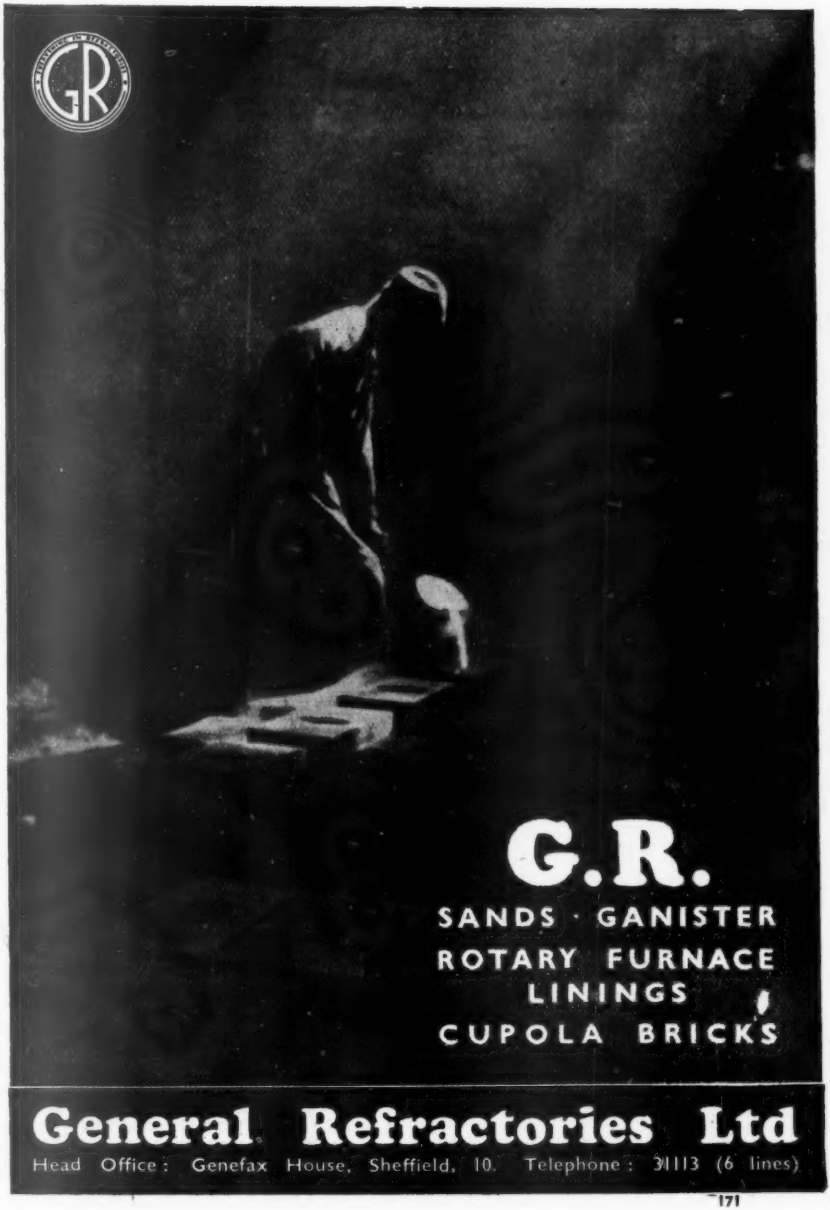
A. Reyrolle & Company—Net profit for 1945, after providing for depreciation, renewals and taxation, and including interest received on investments and loans, £96,701 (£114,771); to development expenditure, £21,509 (£25,000); to general reserve, nil (£40,000); preference dividend, £3,767 (£3,587); final ordinary dividend of 7½%, making 12½% (same); forward, £120,917 (£119,411).

Thos. Firth & John Brown—Balance for 1945, £295,626 (£343,101), after transferring £444,988 to general reserve arising from sale of a foreign trade investment; balance is after providing for a trading loss of £81,223, directors' fees, interest, and depreciation, and after income from investments and subsidiary companies and estimated net E.P.T. recoverable; dividend of 7½% (10%), tax free.

British United Shoe Machinery—Trading profit for 1945, £1,027,894 (£1,229,005); dividends from subsidiaries, £151,342 (£171,346); to depreciation, £105,903 (£107,174); deferred repairs, £32,974 (£10,252); tax, £569,555 (£837,719); net profit, £493,072 (£462,802); to reserve, £108,260 (£77,941); preference dividend, £12,217 (£12,266); final ordinary dividend of 7½%, tax free, making 13½%, tax free (same); forward, £140,575 (same).

John Shaw & Sons, Wolverhampton—Income from subsidiaries for the year ended June 30, 1945, £45,692 (£19,298); net profit, after providing £25,746 (£14,049) for tax and deducting proportion (£8,333) of net dividend receivable from the new subsidiary, Moore & Wright (Sheffield), Limited, representing profits prior to acquisition, £20,155 (£15,392); dividend of 10% (7½%); to reserve, £10,000 (same); forward, £17,530 (£15,750).

Vickers—Dividends and interest received for 1945, less administration and general expenses, £1,566,909 (£1,848,466); other income, £253,273 (£183,899); income-tax, £798,603 (£980,633); debenture interest, £36,374 (£37,136); directors' fees, £13,696 (£12,784); net profit, £971,509 (£1,001,812); dividend of 10% (same); to contingencies reserve, £250,000 (same); debenture redemption sinking fund, £19,827 (£19,064); forward, £1,073,704 (£1,010,434). Trading profit of the group, after providing for E.P.T., £6,322,675; dividends and interest received, £415,711; tax provision, £2,454,350; depreciation, £1,324,659; deferred repairs, £140,000; debenture interest, £36,374; directors' fees, £15,696; profit, £2,660,243; to contingency and other reserves, £526,683; debenture sinking fund, £19,827; dividends on the parent company's preference and ordinary shares, £638,412; forward, £3,428,915.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Raw Material Markets

IRON AND STEEL

Very strong conditions continue to rule in the light-castings trade, in which the demands of the building industry figure prominently. The Control are just about holding their own in meeting the demands for high-phosphorus pig-iron, but stocks are very low both at the furnaces and at consumers' works. The light-castings trade will certainly become much more active and arrangements will have to be made ultimately for increased supplies of pig-iron. General engineering and speciality foundries in many cases are engaged on heavy engineering castings and are very busy. They have no difficulty in getting all they require in the way of special irons, chiefly low- and medium-phosphorus grades, hematite and refined pig-iron. Makers of the latter would like more business and permission has been given for them to accept export orders. All foundries could do with improved supplies of cast scrap, particularly light and medium types. Users of steel scrap are reasonably well satisfied. Current deliveries of coke are only sufficient to cover immediate needs. In many cases inroads have been made into stocks. No difficulty is experienced in acquiring limestone, ganister and firebricks.

Makers of bars have substantial order-books and there is a regular demand from the heavy industries for best bars. More business for crown bars would be welcomed. There is as yet no appreciable increase in the demand for iron strip. Ironworks are well supplied with forge pig-iron and hold reasonably good stocks.

Orders for steel sheets and light and medium plates continue to accumulate. Both from home industries and from overseas the demand is overwhelming, and except for high-priority specifications, delivery dates as far ahead as September are now indicated. This congestion is less acute at the section mills, but these also have an abundance of work in hand and there is a large miscellaneous demand for steel rails and chairs, colliery equipment, steel tubes, and wire of all gauges.

NON-FERROUS METALS

Copper supplies would now seem to be more secure and it is believed in London that the Ministry of Supply has now contracted for sufficient copper from Empire and Chilean producers to cover United Kingdom requirements until the end of the year.

It is understood that the financial aid to Malayan tin producers which is to be made through the Malayan Government will bear interest at 3 per cent. The interest will not become payable until 1950. Producers will draw on the Crown Agents for the Colonies for schemes approved by the Ministry of Supply. The Council of the Malayan Chamber of Mines have considered the proposals, which have since been forwarded to individual companies.

Zinc supplies continue to be satisfactory. Consumption is not likely to expand appreciably until the labour situation eases.

NON-FERROUS SCRAP METAL PRICES

The Minister of Supply has issued the following list of prices of non-ferrous scrap metals. These are prices at Ministry of Supply depots, at which the Minister is prepared to effect a sale to a buyer subject to having sufficient material of that quality available at a convenient depot at any particular time. The list relates to delivery within the current and three following calendar months, but is published without prejudice or commitment. Without notice the schedule of materials may be amended in the light of changing circumstances, and prices may be altered in accordance with market conditions, production costs, and other factors. The publication of the following prices does not constitute an offer of sale. The prices quoted are per ton, ex-works:—

COPPER.—Copper, clean untinned, cut up, £66; bright, untinned copper wire, £67; No. 1 copper wire, £66 10s.; No. 2 copper wire, £64 10s.; shell band scrap (other than turnings), £66; copper turnings (including shell band turnings), £57 10s.

ZINC.—Zinc scrap, £31 10s.

BRASS.—Brass ingots, £57 10s.; S.A.A. webbing, £55 10s.; defective cups and cases, £54 10s.; cut-offs and trimmings, £49 10s.; muffled and/or mechanically treated cases, £52; turnings, loose, £45; fired Q.F. cases, £56; Q.F. webbing, £56; Q.F. cut-offs and trimmings, £54 10s.; Q.F. defective cups and cases, £56; Q.F. turnings, £46; other 70/30 process and manufacturing scrap, £53 10s.; 70/30 metallics, £41; 60/40 rod swarf, £40; process and manufacturing scrap containing over 62 per cent. and up to 68 per cent. copper, £53; broken-down fuse scrap, 60/40, £47; 90/10 gilding metal webbing, £62 10s.; 90/10 gilding metal defective cups and envelopes before filling, £60 10s.; cap metal webbing, 95/5, £63 10s.

Scrap cupro-nickel bullet envelopes (max. antimonial lead content 0.08 per cent.), £74 10s.

GRAHAMSTON IRON COMPANY, LIMITED, Falkirk, have been granted permission by Falkirk Dean of Guild Court to erect a block of lavatories at a cost of £700. Callendar Abbots Foundry Companies, Limited, Falkirk, have also been granted permission to erect cloakrooms for male and female workers at a cost of £770. Dean of Guild Shaw, who presided, said it was pleasing to find that foundries in the Falkirk area were doing so much to provide better accommodation for their workers.

GLENFIELD & KENNEDY, LIMITED, hydraulic engineers and founders, Kilmarnock, have planned to modernise the light engineering section of their works by rebuilding the existing shops and equipping them with additional and improved machine tools. The work will go ahead as soon as a building licence has been granted. Our Scottish correspondent learns that the scheme will cost several hundred thousand pounds and take three years to complete. Another smaller scheme—the mechanisation of the light foundry—is in progress and should be finished in about nine months at a cost of about £35,000.